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SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2002-293**
Matt Gotchy (Sierra) et al., "Computational Analysis of High Aspect Ratio Cooling Channels"
(abstract only)

AIAA/ASME/SAE/ASEE Joint Propulsion Conference
(20 July 2003)

(Statement A)

Computational Analysis of High Aspect Ratio Cooling Channels

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Many parameters can have an effect of the cooling ability and pressure drop performance in high aspect ratio cooling channels (HARCC). However, few studies have attempted to quantify these effects. In the present study, Fluent was used to solve the three-dimensional fluid dynamics and conjugate heat transfer within cooling channels of a variety of aspect ratios. The objective of these studies was to explore the potential impact of the asymmetric heating in a HARCC and to identify parameters which can have a significant effect upon the performance of High Aspect Ratio Cooling channels in order to design an experimental facility which will allow for the validation of the flow phenomenology.

Since the purpose of the analysis was to guide the design of an experimental facility, studies were conducted using both water and gaseous nitrogen as coolants through the channels. Under conditions evaluated thermal striations were not found in the water flows; however, thermal striations were found to occur using GN2 as the coolant. During the course of the analyses, aspect ratios between 2 and 15 were examined as well as the effect of straight and curved channels.

Finally, the preliminary design of a test rig and a conceptual test plan to validate these computations will be presented.